

STREAM INVENTORY REPORT

Bear Canyon Creek

INTRODUCTION

A stream inventory was conducted from June 1, 2009 to June 8, 2009 on Bear Canyon Creek. The survey began at the confluence with South Fork Eel River and extended upstream 1.4 miles.

The Bear Canyon Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Bear Canyon Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, coho salmon, and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Bear Canyon Creek is a tributary to South Fork Eel River, which drains to the Pacific Ocean, located in Humboldt County, California (Map 1). Bear Canyon Creek's legal description at the confluence with South Fork Eel River is T04S R03E S24. Its location is 40.1067 north latitude and 123.7977 west longitude, LLID number 1237965401068. Bear Canyon Creek is a second order stream and has approximately 3.3 miles of blue line stream according to the USGS Garberville 7.5 minute quadrangle. Bear Canyon Creek drains a watershed of approximately 3.5 square miles. Elevations range from about 290 feet at the mouth of the creek to 2,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned. Vehicle access exists via Highway 101 to Redwood Drive to Bear Canyon Road to the South Fork Eel River Bar.

METHODS

The habitat inventory conducted in Bear Canyon Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and

Bear Canyon Creek

embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Bear Canyon Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Bear Canyon Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

Bear Canyon Creek

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Bear Canyon Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Bear Canyon Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Bear Canyon Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Bear Canyon Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

Bear Canyon Creek

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Bear Canyon Creek. In addition, underwater observations were made at 31 sites using techniques described in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Bear Canyon Creek

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Bear Canyon Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of June 1, 2009 to June 8, 2009, was conducted by M. Groff and T. Fleming (WSP). The total length of the stream surveyed was 7,602 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.53 cfs on June 1, 2009.

Bear Canyon Creek is a F4 channel type for 3,316 feet of the stream surveyed (Reach 1), a G4 channel type for 2,340 feet of the stream surveyed (Reach 2), and an A3 channel type for 1,946 feet of the stream surveyed (Reach 3). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with gravel-dominant substrates. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios, very stable with gravel-dominant substrates. A3 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 54 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% riffle units, 32% pool units, and 25% flatwater units (Graph 1). Based on total length of Level II habitat types there were 42% riffle units, 27% pool units, and 24% flatwater units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were high gradient riffle units, 28%; mid-channel pool units, 25%; and run

Bear Canyon Creek

units, 18% (Graph 3). Based on percent total length, high gradient riffle units made up 30%; mid-channel pool units 21%; and run units 14%.

A total of 69 pools were identified (Table 3). Main channel pools were the most frequently encountered at 81% (Graph 4), and comprised 83% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twelve of the 69 pools (17%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 69 pool tail-outs measured, 14 had a value of 1 (20.3%); 24 had a value of 2 (34.8%); and 31 had a value of 3 (44.9%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 2, flatwater habitat types had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 22 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating of 32. Main channel pools had a mean shelter rating of 20 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Bear Canyon Creek. Graph 7 describes the pool cover in Bear Canyon Creek. Boulders are the dominant pool cover type followed by undercut banks.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 75% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 20% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Bear Canyon Creek was 87%. Thirteen percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 94% and 6%, respectively. Graph 9 describes the mean percent canopy in Bear Canyon Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 91%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 34% bedrock, 31% sand/silt/clay, 22% cobble/gravel, and 13% boulder (Graph 10). Deciduous trees were the dominant vegetation type observed in 62% of the units surveyed. Additionally, 31% of the units surveyed had brush as the dominant vegetation type, and 4% had coniferous as the dominant vegetation type.

Bear Canyon Creek

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 31 sites for fish species composition and distribution in Bear Canyon Creek on June 10, 2009. Water temperatures taken during the sampling period of 0910 to 1315 ranged from 54 to 57 degrees Fahrenheit. Air temperatures ranged from 60 to 60 degrees Fahrenheit. The sites were sampled by S. McSmith (DFG) and T. Fleming (WSP).

In reach 1, which comprised the first 3,316 feet of stream, 10 sites were sampled. The reach sites yielded 20 young-of-the-year steelhead/rainbow trout (SH/RT), 2 age 1+ SH/RT, 9 coho, and a mix of Sacramento pikeminnow and California roach that totaled 142.

In reach 2, 10 sites were sampled starting approximately 3,317 from the confluence with the South Fork of the Eel River and continuing upstream 2,340 feet. The reach sites yielded no young-of-the-year SH/RT, 4 age 1+ SH/RT, 2 age 2+ SH/RT, 2 rough skinned newts and 2 crawfish.

In reach 3, 11 sites were sampled starting approximately 5,657 from the confluence with the South Fork of the Eel River and continuing upstream 1,946 feet. The reach sites yielded no young-of-the-year SH/RT, 2 age 1+ SH/RT, 2 age 2+ SH/RT, 2 rough skinned newts, 2 crawfish and 1 pacific giant salamander.

The following chart displays the information yielded from these sites:

2009 Bear Canyon Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: F4 Channel Type									
06/10/09	1	004	5.4	158	0	0	0	0	0
06/10/09	2	005	4.2	194	5	1	0	3	0
06/10/09	3	009	4.2	384	4	0	0	0	0
06/10/09	4	012	5.4	591	11	0	0	6	0
06/10/09	5	021	5.2	1370	0	0	0	0	0
06/10/09	6	029	4.2	1742	0	0	0	0	0
06/10/09	7	036	4.2	2053	0	1	0	0	0
06/10/09	8	040	5.4	2201	0	0	0	0	0
06/10/09	9	049	4.2	2506	0	0	0	0	0
06/10/09	10	053	4.2	2698	0	0	0	0	0
Reach 2: G4 Channel Type									
06/10/09	11	077	4.2	3479	0	0	0	0	0

Bear Canyon Creek

06/10/09	12	084	4.2	3821	0	1	1	0	0
06/10/09	13	088	4.2	3917	0	0	0	0	0
06/10/09	14	100	4.2	4421	0	2	0	0	0
06/10/09	15	104	4.2	4376	0	0	0	0	0
06/10/09	16	119	4.2	4831	0	0	0	0	0
06/10/09	17	121	4.2	4908	0	0	0	0	0
06/10/09	18	137	4.2	5420	0	0	0	0	0
06/10/09	19	140	4.2	5485	0	0	0	0	0
06/10/09	20	144	4.2	5642	0	1	1	0	0
Reach 3: A3 Channel Type									
06/10/09	21	146	4.2	5680	0	2	2	0	0
06/10/09	22	151	4.2	5807	0	0	0	0	0
06/10/09	23	157	4.2	6044	0	0	0	0	0
06/10/09	24	166	4.2	6291	0	0	0	0	0
06/10/09	25	179	4.2	6631	0	0	0	0	0
06/10/09	26	183	5.6	6711	0	0	0	0	0
06/10/09	27	193	4.2	7048	0	0	0	0	0
06/10/09	28	196	4.4	7131	0	0	0	0	0
06/10/09	29	202	4.2	7227	0	0	0	0	0
06/10/09	30	208	4.4	7427	0	0	0	0	0
06/10/09	31	212	4.2	7483	0	0	0	0	0

DISCUSSION

Bear Canyon Creek is an F4 channel type for the first 3,316 feet of stream surveyed, a G4 channel type for the next 2,340 feet, and an A3 channel type for the remaining 1,946 feet. The suitability of F4, G4, and A3 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover. A2 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days June 1, 2009 to June 8, 2009, ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 54 to 72 degrees Fahrenheit. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 24% of the total length of this survey, riffles 42%, pools 27% and 7% culvert. Twelve of the 69 (17%) pools had a maximum residual depth greater than 2

Bear Canyon Creek

feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low-flow channel width. Installing structures that will increase or deepen pool habitat is recommended for Reach 1.

Thirty-eight of the 69 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty-one of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Bear Canyon Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Sixty-six of the 69 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools is 22. The shelter rating in the flatwater habitats is 11. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Bear Canyon Creek. Boulders are the dominant cover type in pools followed by undercut banks. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 87%. Reach 1 had a canopy density of 79%, Reach 2 had a canopy density of 93%, and Reach 3 had a canopy density of 89%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 91% and 96%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

- 1) Bear Canyon Creek should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.
- 3) Where feasible, design and engineer pool enhancement structures to increase the number of pools in Reach 1. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

Bear Canyon Creek

- 4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from boulders. Adding high quality complexity with woody cover in the pools is desirable.
- 5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Habitat Unit #:	Comments:
0	0001.00	Start of survey on the gravel bar of the South Fork Eel River. The channel type is an F4.
614	0014.00	U.S. Highway 101 crosses the stream. The crossing is a 9.3' high x 12.6' wide x 569' long concrete arch culvert with 8 metal weirs inside.
1183	0015.00	This is the first unit outside of the influence of the South Fork Eel River.
1272	0018.00	There is a left bank seep.
1764	0031.00	There is a landslide on right bank approximately 150' long x 80' high.
2335	0045.00	Tributary #01 enters from the left banks. The flow in the tributary is approximately 0.1 cfs; it is contributing less than one percent of the flow of Bear Canyon Creek. The water temperature of the tributary was 56 degrees Fahrenheit. The water temperature downstream of the confluence was 56 degrees Fahrenheit. The water temperature upstream of the confluence was 58 degrees Fahrenheit. The tributary has a 20% gradient, making it inaccessible to fish. No fish were observed in the tributary.
2762	0056.00	Log debris accumulation (LDA) #01 is 5.5' high x 30' wide x 25' long and consists of 7 pieces of large woody debris (LWD). There are gaps visible in the LDA and water flows through. It is not retaining sediment. The LDA is not a barrier to salmonids. Fish are above the LDA.

Bear Canyon Creek

2791	0058.00	There is a landslide on left bank approximately 35' long x 40' high.
3174	0070.00	LDA #02 is 4' high x 25' wide x 20' long and consists of 1 piece of LWD. There are gaps visible in the LDA and water flows through. It is not retaining sediment. The LDA is not a barrier to fish. Fish are above the LDA.
3316	0073.00	The channel changes from an F4 to a G4.
3434	0076.00	There is a slump on right bank.
3602	0080.00	LDA #03 is 2' high x 40' wide x 30' long and consists of 6 pieces of LWD. There are gaps visible in the LDA and water flows through. It is not retaining sediment. The LDA is not a barrier to fish. Fish are above the LDA.
3917	0089.00	Tributary #02 "South Fork Bear Canyon Creek" enters from the left bank. See South Fork Bear Canyon Creek 2009 Stream Habitat Inventory Report.
4208	0100.00	There is a boulder weir at the top of the pool. Three tires are caught by the structure.
4871	0121.00	There is a seep on left bank associated with a slump that is approximately 35' long x 10' high contributing sediment ranging in size from silt to gravel.
5656	0146.00	The channel changes from a G4 to an A3.
5807	0152.00	Tributary #03 enters from the right bank. The flow in the tributary is less than 0.05 cfs and it is contributing one percent of the flow of Bear Canyon Creek. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream of the confluence was 56 degrees Fahrenheit. The water temperature upstream of the confluence was 58 degrees Fahrenheit. The tributary has a ten percent gradient and is not accessible to fish due to a debris blockage 40' from the mouth.
6088	0159.00	Tributary #04 enters from the right bank. The flow in the tributary is less than 0.05 cfs and it is contributing two percent of the flow of Bear Canyon Creek. The water temperature of the tributary was 58 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 58 degrees Fahrenheit. The tributary has a 30% gradient making it inaccessible to fish.

Bear Canyon Creek

6088	0159.00	LDA #04 is 3' high x 26' wide x 17' long and consists of 5 pieces of LWD. There are gaps visible in the LDA and water flows through. The retained sediment ranges from silt to gravel and measures 26' wide x 15' long x 1' deep. The LDA is not a barrier to salmonids. Fish are above the LDA.
6291	0167.00	Erosion on left bank is approximately 45' high x 160' long contributing sediment ranging in size from silt to gravel.
6698	0183.00	LDA #05 is 3' high x 35' wide x 20' long and consists of 6 pieces of LWD. There are gaps visible in the LDA and water flows through. The retained sediment ranges from silt to gravel and measures 12' wide x 8' long x 12.5' deep. The LDA is a possible barrier to juvenile salmonids. Fish are above the LDA.
6998	0192.00	Erosion on right bank approximately 80' high x 150' long contributing silt to gravel.
7343	0207.00	There is a landslide on left bank approximately 100' long x 40' high contributing sediment ranging from silt to small cobble.
7553	0216.00	Possible end of anadromy. The gradient is over 20% and large boulders fill the channel. At the base of the gradient increase the flow is subterranean for 16' below a 5' jump with a 1' jump pool.
7602	0218.00	Survey ended due to very large cascade.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

Bear Canyon Creek

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Bear Canyon

LLID: 1237965401068 Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:06:24.0N Longitude: 123:47:47.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
1	0	CULVERT	0.5	569	569	7.5									
1	0	DRY	0.5	16	16	0.2									
55	12	FLATWATER	25.2	33	1806	23.8	8.3	0.5	0.9	326	17950	154	8463		11
69	69	POOL	31.7	30	2050	27.0	9.8	0.6	1.4	292	20137	289	19909	211	22
92	15	RIFFLE	42.2	34	3161	41.6	8.0	0.3	0.6	202	18573	61	5628		2
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
218	96				7602					56660			33999		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Bear Canyon

LLID: 1237965401068

Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Confluence Location: Quad: GARBERVILLE

Legal Description: T04SR03ES24

Latitude: 40:06:24.0N

Longitude: 123:47:47.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
27	6	LGR	12.4	30	820	10.8	7	0.3	0.9	153	4124	39	1061		1	89
62	9	HGR	28.4	37	2280	30.0	9	0.3	0.8	235	14548	76	4697		3	93
3	0	CAS	1.4	20	61	0.8										
39	7	RUN	17.9	27	1067	14.0	9	0.5	1.6	286	11147	138	5390		13	85
16	5	SRN	7.3	46	739	9.7	7	0.5	1	383	6130	176	2813		8	93
54	54	MCP	24.8	30	1629	21.4	9	0.6	3.2	296	15971	291	15713	213	20	86
2	2	STP	0.9	32	64	0.8	10	0.6	1.4	287	575	222	444	154	28	95
1	1	CRP	0.5	16	16	0.2	8	0.9	1.7	128	128	141	141	115	160	89
7	7	LSBk	3.2	40	280	3.7	12	0.6	2.3	412	2887	451	3156	333	9	78
5	5	PLP	2.3	12	61	0.8	10	0.5	1.6	115	576	91	454	63	39	86
1	0	DRY	0.5	16	16	0.2										
1	0	CUL	0.5	569	569	7.5										

Total Units
218

Total Units Fully Measured
96

Total Length (ft.)
7602

Total Area (sq.ft.)
56086

Total Volume (cu.ft.)
33869

Table 3 - Summary of Pool Types

Stream Name: Bear Canyon

LLID: 1237965401068

Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Confluence Location: Quad: GARBERVILLE

Legal Description: T04SR03ES24

Latitude: 40:06:24.0N

Longitude: 123:47:47.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
56	56	MAIN	81	30	1693	83	9.5	0.6	295	16546	211	11822	20
13	13	SCOUR	19	27	357	17	11.2	0.6	276	3591	212	2761	32

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
69	69	2050	20137	14583

Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Bear Canyon

LLID: 1237965401068

Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Confluence Location: Quad: GARBERVILLE

Legal Description: T04SR03ES24

Latitude: 40:06:24.0N

Longitude: 123:47:47.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
54	MCP	78	7	13	37	69	9	17	1	2	0	0
2	STP	3	0	0	2	100	0	0	0	0	0	0
1	CRP	1	0	0	1	100	0	0	0	0	0	0
7	LSBk	10	2	29	3	43	2	29	0	0	0	0
5	PLP	7	1	20	4	80	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
69	10	14	47	68	11	16	1	1	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Bear Canyon

LLID: 1237965401068

Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Dry Units: 1

Confluence Location: Quad: GARBERVILLE

Legal Description: T04SR03ES24

Latitude: 40:06:24.0N

Longitude: 123:47:47.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
27	6	LGR	0	0	0	0	0	0	0	100	0
62	10	HGR	0	1	0	0	1	0	3	95	0
3	0	CAS									
92	16	TOTAL RIFFLE	0	1	0	0	1	0	3	96	0
39	7	RUN	7	30	12	4	0	0	0	48	0
16	5	SRN	0	10	0	6	0	0	1	83	0
55	12	TOTAL FLAT	4	21	6	5	0	0	0	64	0
54	54	MCP	16	10	10	4	7	0	1	51	0
2	2	STP	0	3	5	0	18	0	0	75	0
1	1	CRP	0	40	10	0	40	0	0	10	0
7	7	LSBk	0	27	14	0	1	0	0	57	0
5	5	PLP	0	3	30	3	0	0	2	62	0
69	69	TOTAL POOL	13	11	12	3	7	0	1	53	0
1	0	CUL									
218	97	TOTAL	11	12	10	3	6	0	1	58	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Bear Canyon

LLID: 1237965401068

Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Dry Units: 1

Confluence Location: Quad: GARBERVILLE

Legal Description: T04SR03ES24

Latitude: 40:06:24.0N

Longitude: 123:47:47.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
27	6	LGR	0	0	33	50	0	17	0
62	9	HGR	0	0	33	33	11	22	0
3	0	CAS	0	0	0	0	0	0	0
39	7	RUN	14	0	71	0	0	14	0
16	5	SRN	0	0	40	20	40	0	0
54	54	MCP	4	11	74	4	2	4	2
2	2	STP	0	0	100	0	0	0	0
1	1	CRP	0	100	0	0	0	0	0
7	7	LSBk	0	29	43	0	29	0	0
5	5	PLP	0	0	60	0	40	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Bear Canyon

LLID: 1237965401068

Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Confluence Location: Quad: GARBERVILLE

Legal Description: T04SR03ES24

Latitude: 40:06:24.0N

Longitude: 123:47:47.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
87	6	94	0	91	96

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Bear Canyon LLID: 1237965401068 Drainage: Eel River - South Fork
 Survey Dates: 6/1/2009 to 6/8/2009 Survey Length (ft.): 7602 Main Channel (ft.): 7602 Side Channel (ft.): 0
 Confluence Location: Quad: GARBERVILLE Legal Description: T04SR03ES24 Latitude: 40:06:24.0N Longitude: 123:47:47.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4	Canopy Density (%): 79.3	Pools by Stream Length (%): 33.6
Reach Length (ft.): 3316	Coniferous Component (%): 10.6	Pool Frequency (%): 36.1
Riffle/Flatwater Mean Width (ft.): 11.6	Hardwood Component (%): 89.4	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 69
Range (ft.): 23 to 39	Vegetative Cover (%): 90.2	2 to 2.9 Feet Deep: 27
Mean (ft.): 29	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 4
Std. Dev.: 5	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.5	Occurrence of LWD (%): 11	Mean Max Residual Pool Depth (ft.): 1.6
Water (F): 56 - 60 Air (F): 57 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating: 25
Dry Channel (ft): 0	Riffles: 1	
	Pools: 3	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 73 Sm Cobble: 23 Lg Cobble: 4 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 46.2 2. 34.6 3. 19.2 4. 0.0 5. 0.0		

STREAM REACH: 2

Channel Type: G4	Canopy Density (%): 93.7	Pools by Stream Length (%): 23.4
Reach Length (ft.): 2340	Coniferous Component (%): 2.2	Pool Frequency (%): 30.1
Riffle/Flatwater Mean Width (ft.): 7.9	Hardwood Component (%): 97.8	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 91
Range (ft.): 13 to 29	Vegetative Cover (%): 98.6	2 to 2.9 Feet Deep: 9
Mean (ft.): 22	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 0
Std. Dev.: 5	Dominant Bank Substrate Type: Bedrock	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.5	Occurrence of LWD (%): 3	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 56 - 58 Air (F): 54 - 60	LWD per 100 ft.:	Mean Pool Shelter Rating: 15
Dry Channel (ft): 0	Riffles: 1	
	Pools: 2	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 77 Sm Cobble: 18 Lg Cobble: 5 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 9.1 2. 36.4 3. 54.5 4. 0.0 5. 0.0		

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: A3	Canopy Density (%): 89.4	Pools by Stream Length (%): 19.9
Reach Length (ft.): 1946	Coniferous Component (%): 4.5	Pool Frequency (%): 28.8
Riffle/Flatwater Mean Width (ft.): 5.9	Hardwood Component (%): 95.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 90
Range (ft.): 15 to 29	Vegetative Cover (%): 92.1	2 to 2.9 Feet Deep: 10
Mean (ft.): 23	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 0
Std. Dev.: 4	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.5	Occurrence of LWD (%): 10	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 56 - 60	Air (F): 54 - 72	LWD per 100 ft.:
Dry Channel (ft): 16	Riffles: 2	Pools: 7
	Flat: 3	
Pool Tail Substrate (%): Silt/Clay: 0	Sand: 0	Gravel: 76
	Sm Cobble: 19	Lg Cobble: 5
	Boulder: 0	Bedrock: 0
Embeddedness Values (%): 1. 0.0	2. 33.3	3. 66.7
	4. 0.0	5. 0.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Bear Canyon

LLID: 1237965401068

Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Confluence Location: Quad: GARBERVILLE

Legal Description: T04SR03ES24

Latitude: 40:06:24.0N

Longitude: 123:47:47.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	20	46	34.4
Boulder	15	10	13.0
Cobble / Gravel	20	22	21.9
Sand / Silt / Clay	41	18	30.7

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	1	0.5
Brush	22	38	31.3
Hardwood Trees	70	50	62.5
Coniferous Trees	4	3	3.6
No Vegetation	0	4	2.1

Total Stream Cobble Embeddedness Values: 2

Table 10 - Mean Percent of Shelter Cover Types For Entire Stream

StreamName: Bear Canyon

LLID: 1237965401068

Drainage: Eel River - South Fork

Survey Dates: 6/1/2009 to 6/8/2009

Confluence Location: Quad: GARBERVILLE

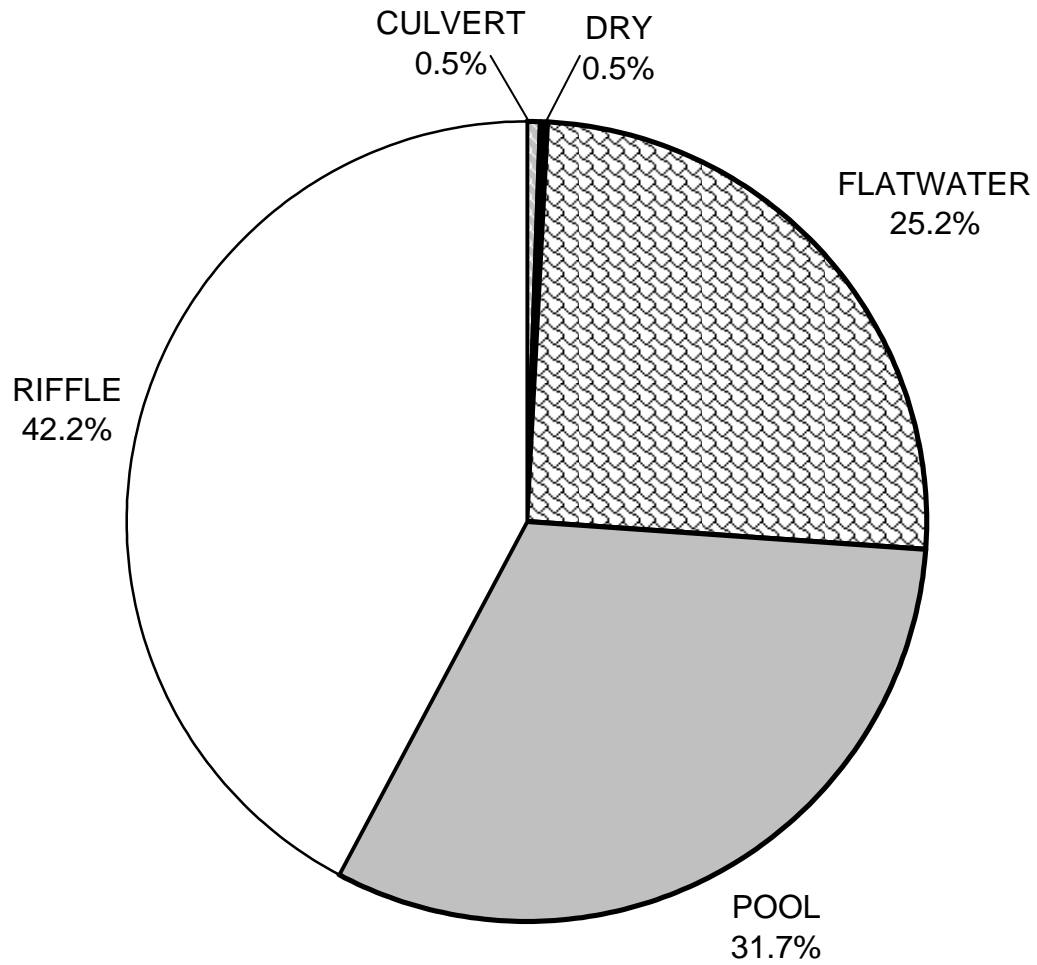
Legal Description: T04SR03ES24

Latitude: 40:06:24.0N

Longitude: 123:47:47.0W

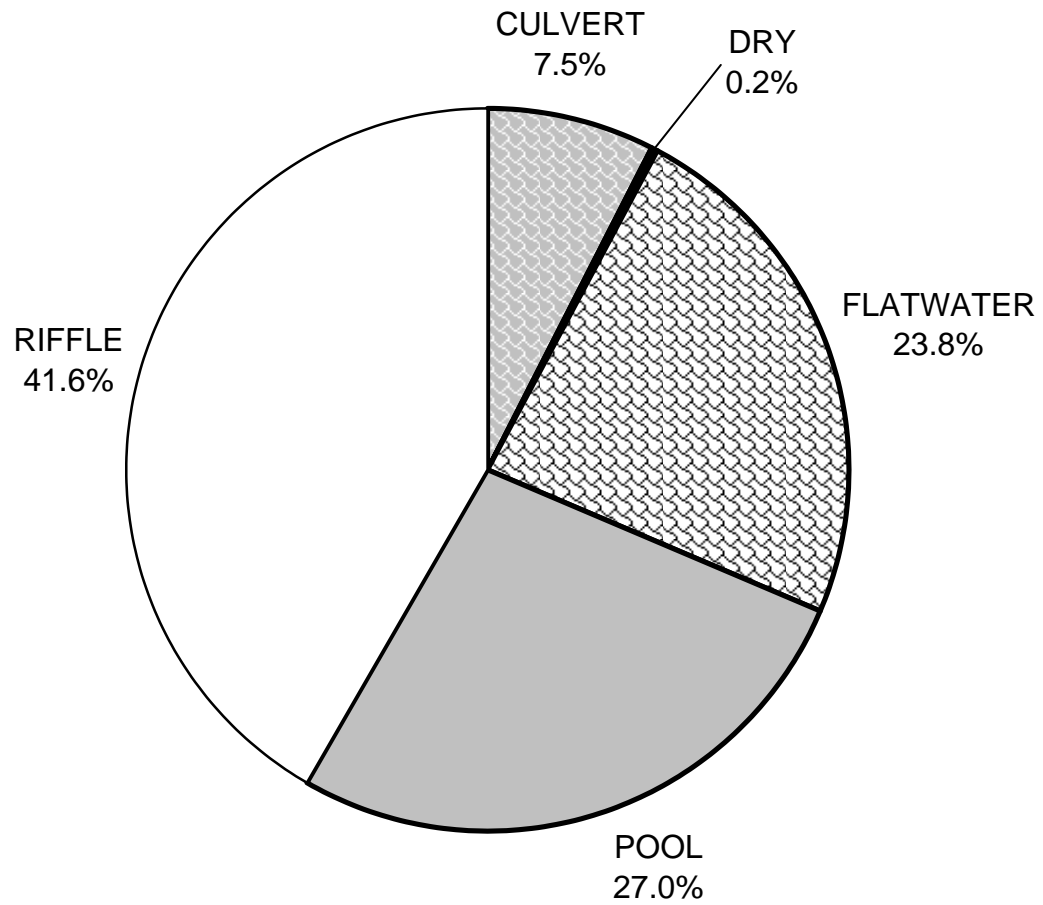
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	4	13
SMALL WOODY DEBRIS (%)	1	21	11
LARGE WOODY DEBRIS (%)	0	6	12
ROOT MASS (%)	0	5	3
TERRESTRIAL VEGETATION (%)	1	0	7
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	3	0	1
BOULDERS (%)	96	64	53
BEDROCK LEDGES (%)	0	0	0

BEAR CANYON 2009 HABITAT TYPES BY PERCENT OCCURRENCE



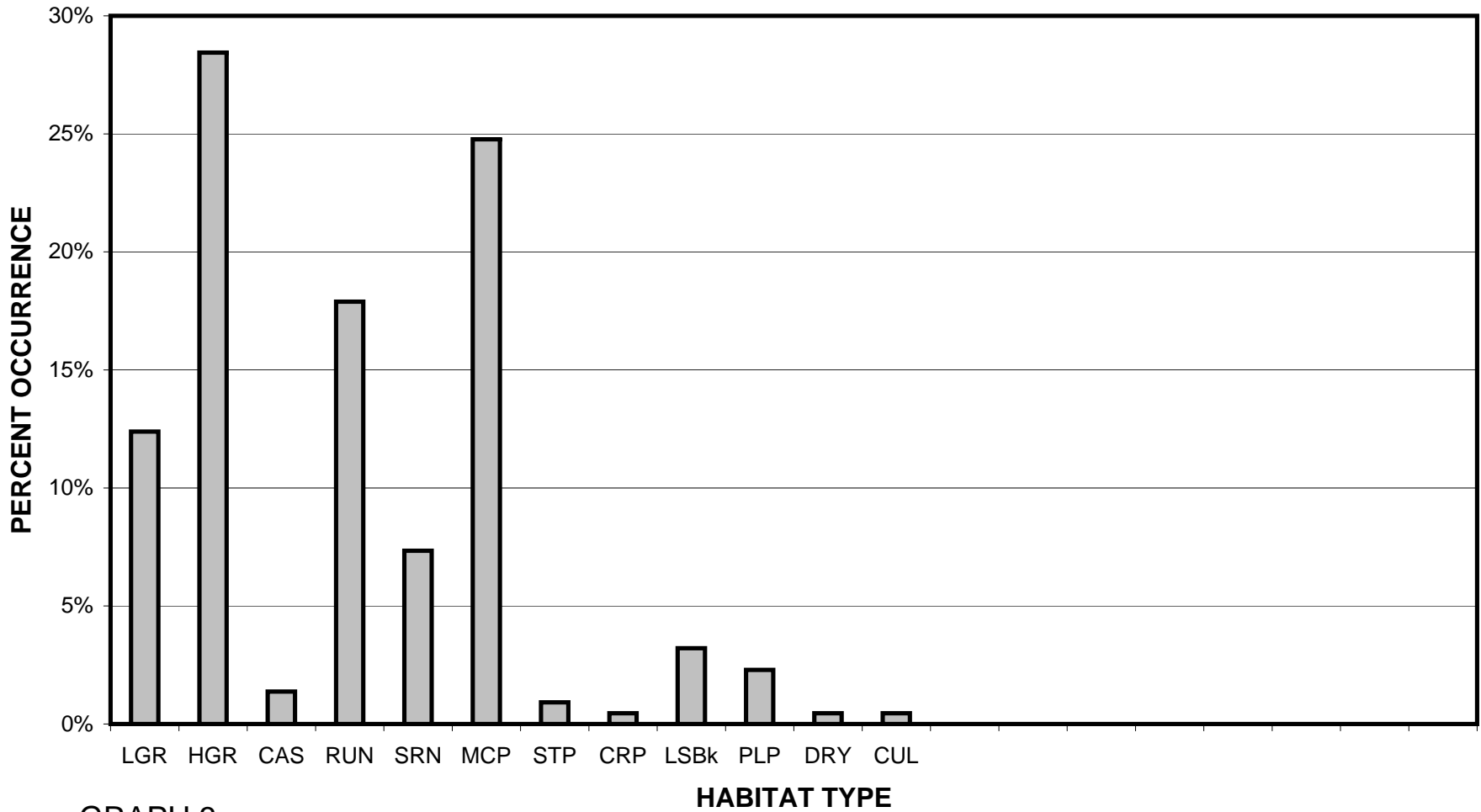
GRAPH 1

BEAR CANYON 2009 HABITAT TYPES BY PERCENT TOTAL LENGTH



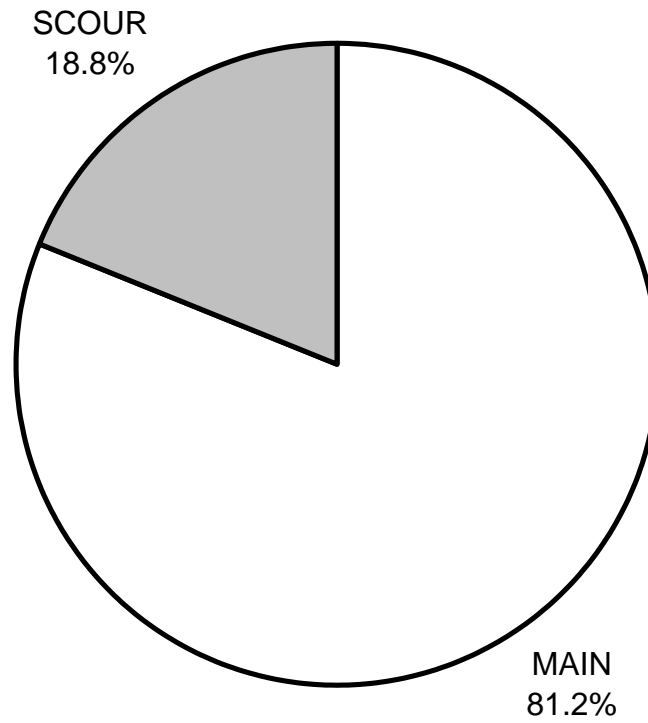
GRAPH 2

BEAR CANYON 2009 HABITAT TYPES BY PERCENT OCCURRENCE



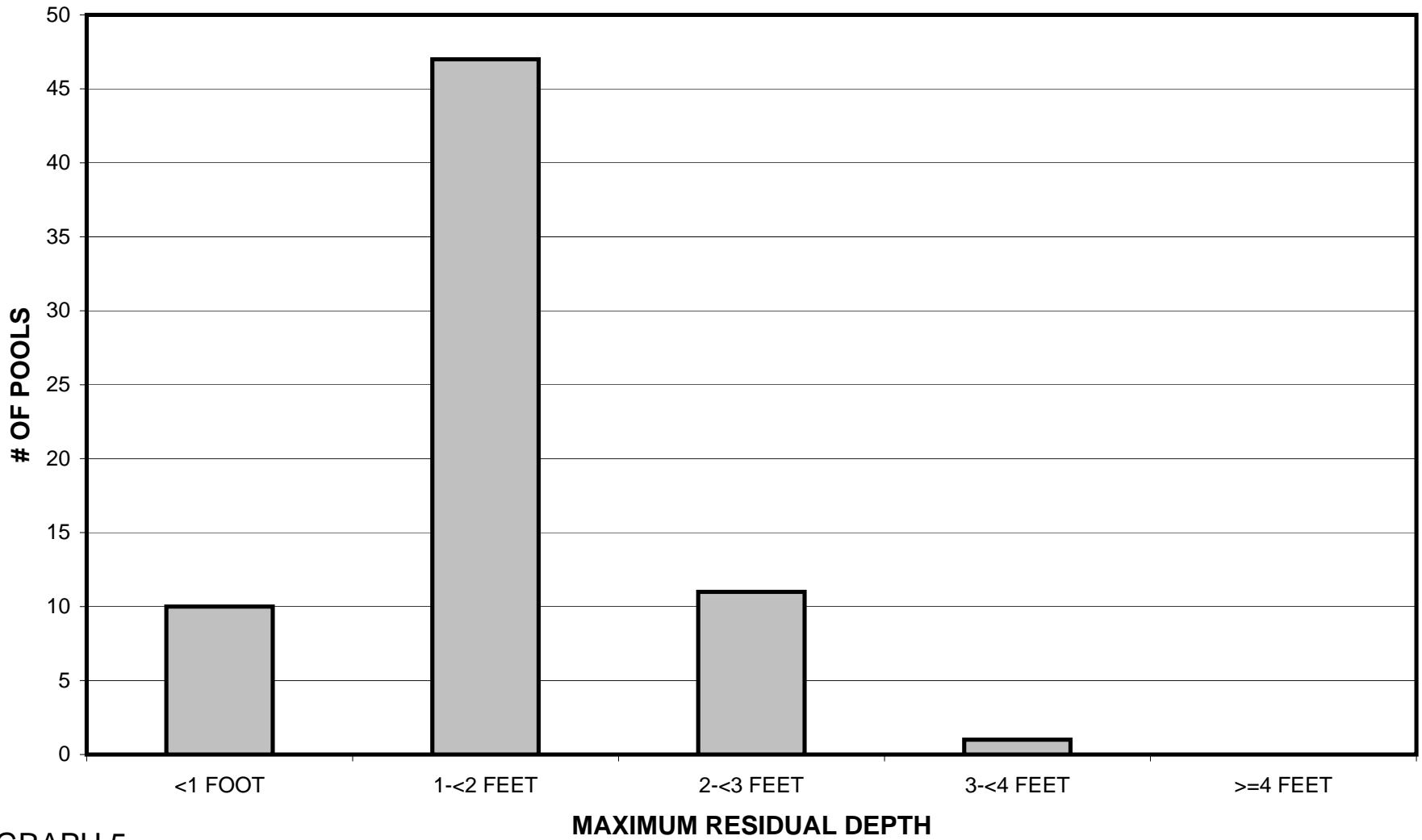
GRAPH 3

**BEAR CANYON 2009
POOL TYPES BY PERCENT OCCURRENCE**



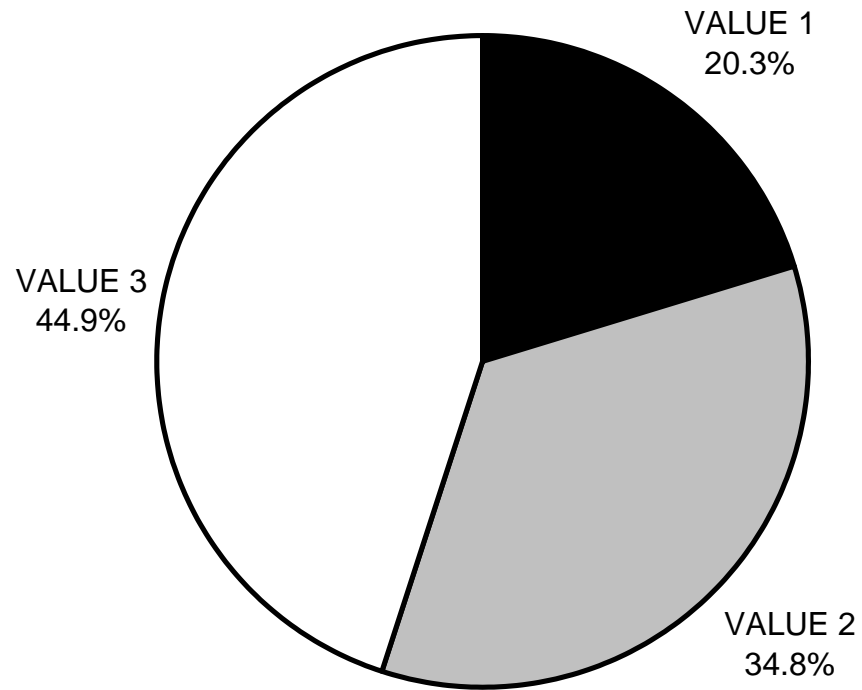
GRAPH 4

BEAR CANYON 2009 MAXIMUM DEPTH IN POOLS



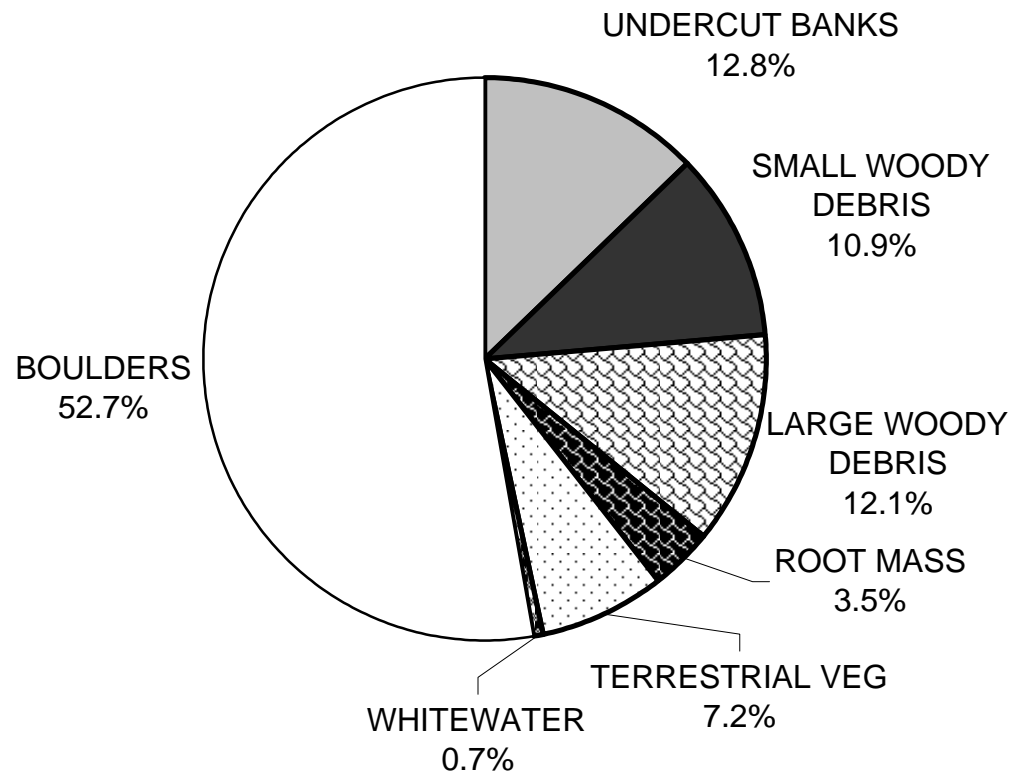
GRAPH 5

BEAR CANYON 2009 PERCENT EMBEDDEDNESS



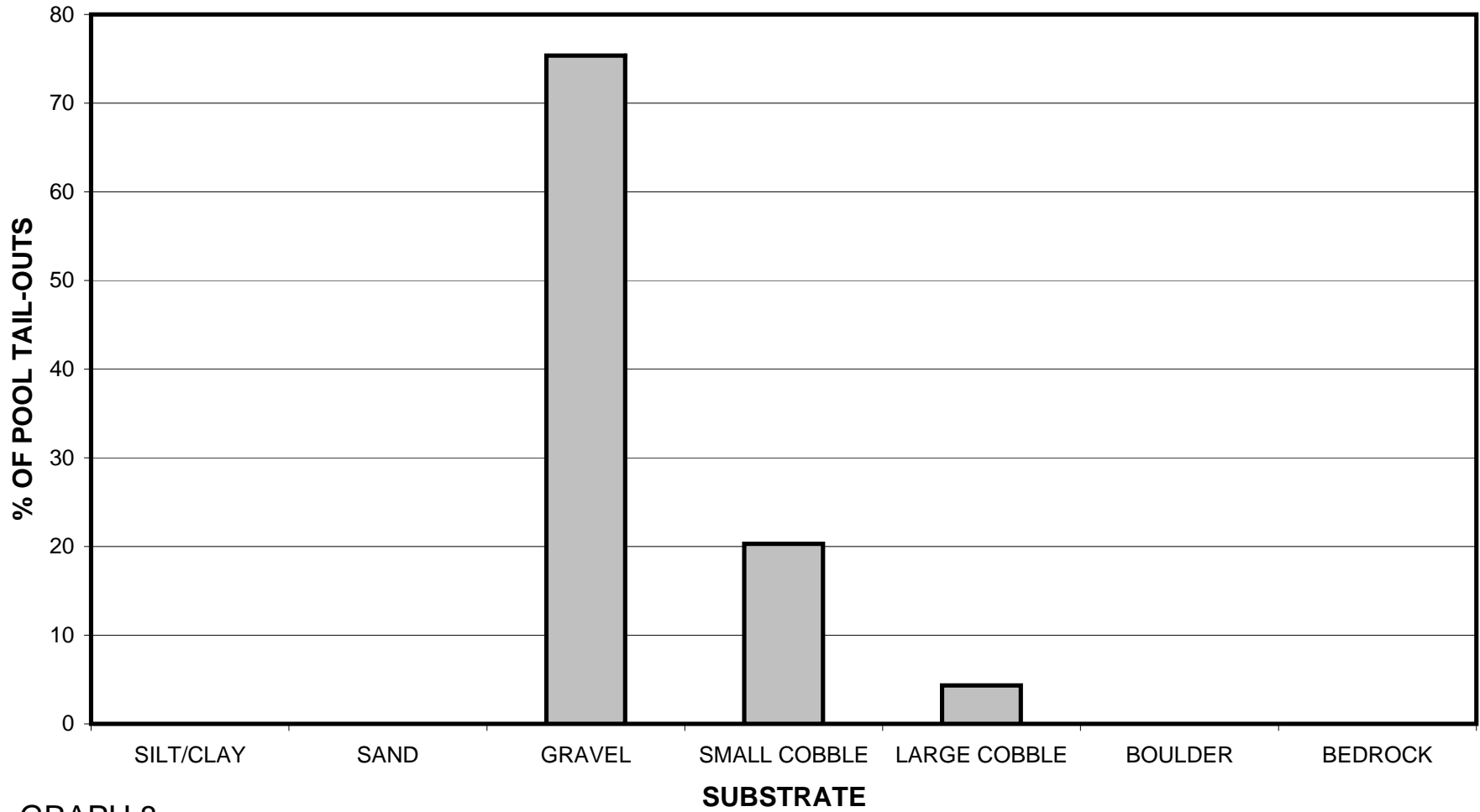
GRAPH 6

BEAR CANYON 2009 MEAN PERCENT COVER TYPES IN POOLS



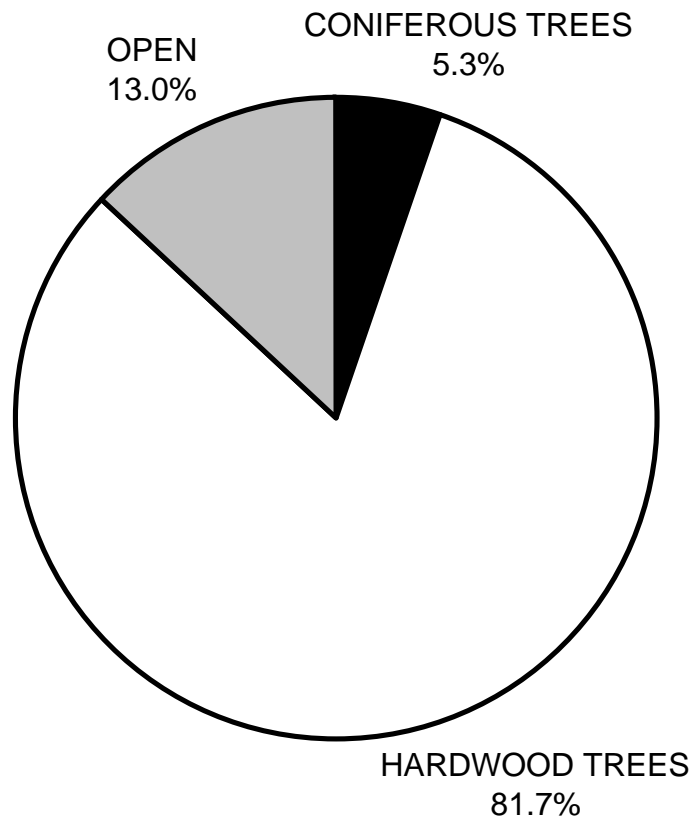
GRAPH 7

BEAR CANYON 2009 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



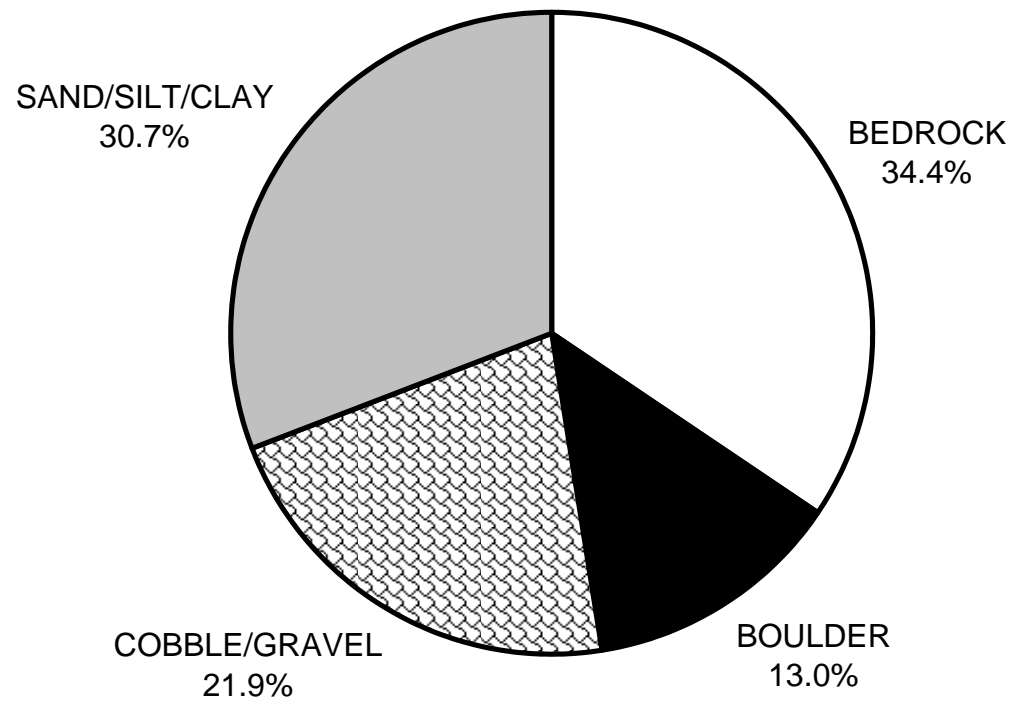
GRAPH 8

BEAR CANYON 2009 MEAN PERCENT CANOPY



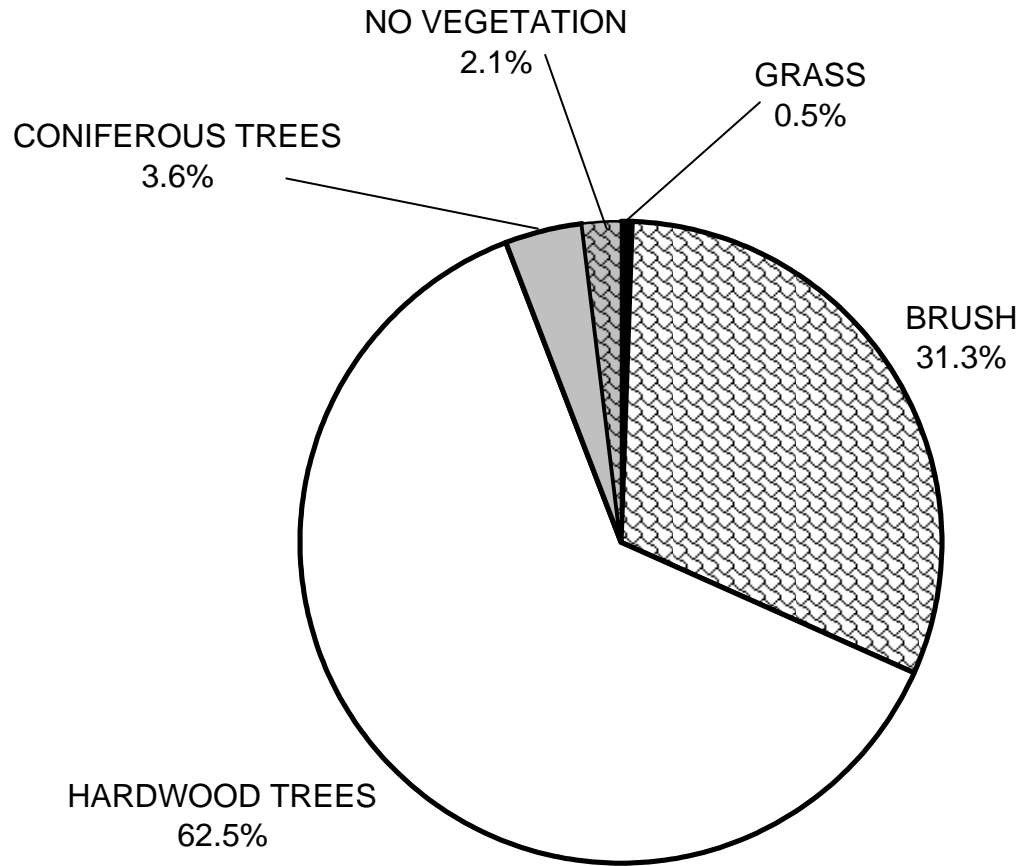
GRAPH 9

**BEAR CANYON 2009
DOMINANT BANK COMPOSITION IN SURVEY REACH**



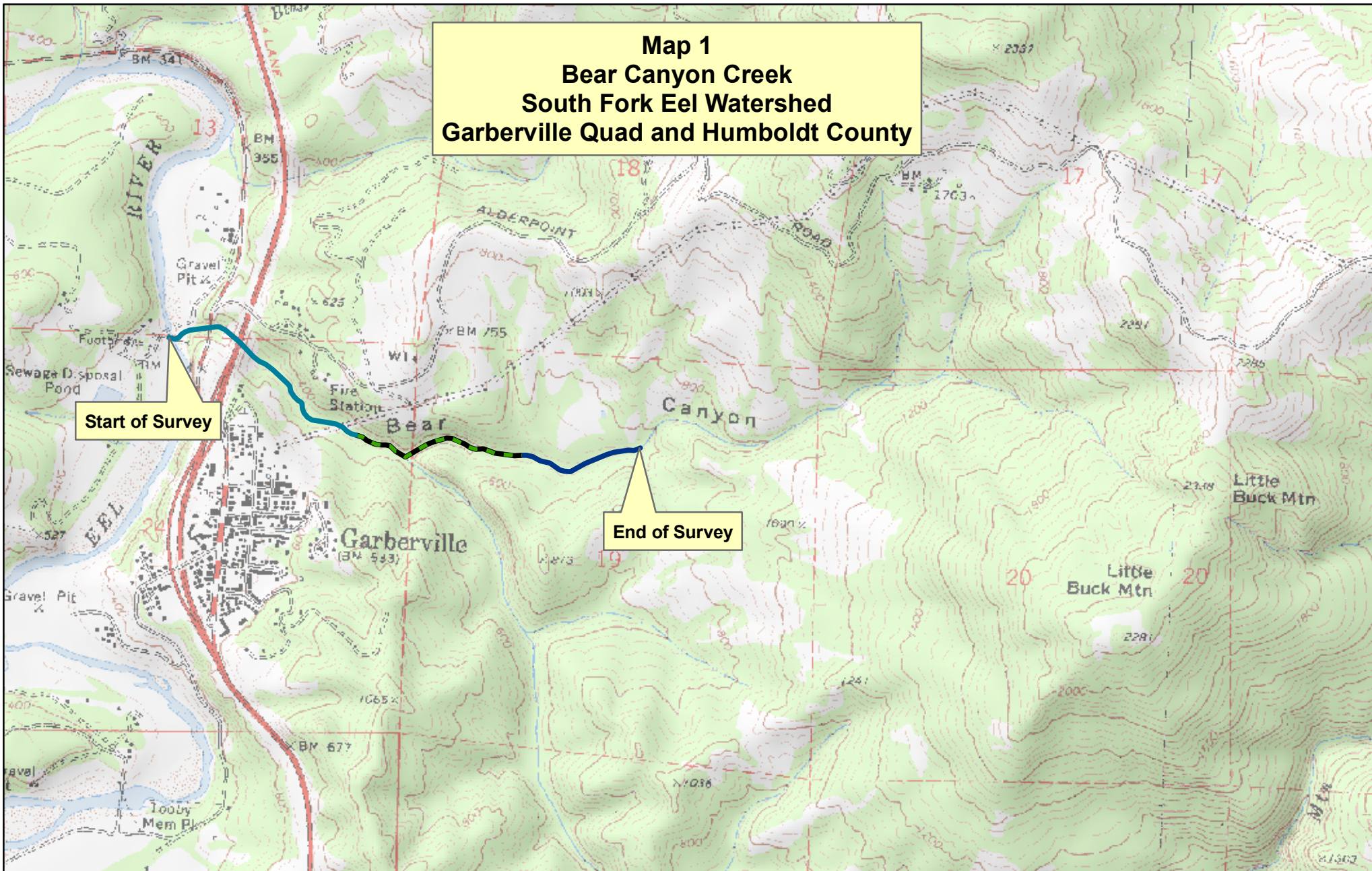
GRAPH 10

BEAR CANYON 2009 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Map 1
Bear Canyon Creek
South Fork Eel Watershed
Garberville Quad and Humboldt County



Start of Survey

End of Survey



Legend

- Reach 1, Channel Type F4
- - - Reach 2, Channel Type G4
- Reach 3, Channel Type A3

